Contents

Page

EasySense Flash Logger

What's in the pack? 4
What else is required? ..... 5&6
Installing the Sensing Science Laboratory software ..... 6&8
System Setup 9
***Smart Q* Sensors 10**
Power Requirements 11
Technical Specifications 12
Information for PDA Users 13
Problem Solving 15

The Sensing Science Laboratory CE Software

Sensing Science Laboratory Software 18
Selecting the Correct Interface 19

The Meters Program 19-24
Changes 20
Gauge 21
Dial 21
Numeric 22
Options menu 22-24
(Decimals, Show Min/Max, Reset Min/Max, Full Screen,
Temperature Range, Sensor Setup, Reset Interface)

File Menu **24**
(Interface, Setup Menu)

The Graph Program **26-46**
The Graph Window 26
Recording Measurements (Primary Mode) **28**
Recording Measurements (Advanced Mode) **29**
To Begin Recording Data **32**
Displaying Captured Data **33-36**
(The Display Menu, Zoom, Auto Scale, Sensors, Use selection)
Selecting Data **35**
Analysing Captured Data **36-38**
(Values, Interval, Area, Gradient)
Using Tools on the capture data **38-44**
(Predict, Smooth, Text, Title, Erase Predictions, Erase Data Set,
Selection Wizard, The Function Wizard**,** To calculate an Average,
To enter Data Manually)
File Menu 44
Edit Menu 46

The Sensor Configuration Program **46-49**
Set Range 46
Calibrate 47

The Timer Program **49-61**
The Timer Window 49
Digital Sensors 50
Timing Apparatus 50

Recording Measurements (Primary Mode) **51**
Recording Measurements (Advanced Mode) **52-55**
To Begin Recording Data **55**
Displaying Captured Measurements **55-57**
(Altering the Vertical Axis, Using the Comments column,
Selecting Data, Use Selection, To Delete Data)
Analysing Captured Data **58-59**
(Show Calculation, Difference, Average, Graph)
File Menu 60
Edit Menu 61
Options Menu 61
Display Menu 61

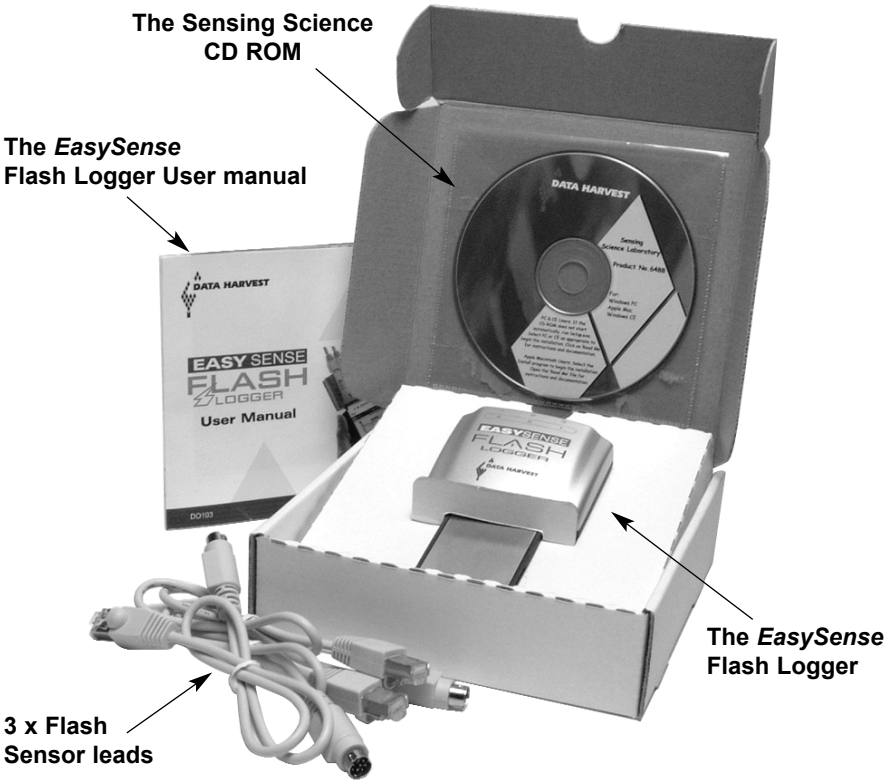
The Workroom Program **62-67**
Creating, Saving and Opening a Setup 63
Worksheets 65
File Menu 67

This manual may be copied for use within the premises of the Licensee on condition that it is not loaned, sold or used outside the Licensee's premises.

Copyright: all rights reserved

Data Harvest's policy is to continually improve products and services, so we reserve the right to make changes without notice. It is acknowledged that there may be error or omissions in this publication for which responsibility cannot be assumed. No liability will be accepted for loss or damage resulting from use of information contained in this manual or from uses as described.

What's in the pack?



What else is required to use EasySense Flash Logger on a Pocket PC?

1. A **Pocket PC** or **Handheld PC –** referred to collectively in this manual as a PDA (Personal Digital Assistant).

   - The PDA needs to have a **CompactFlash™** slot available – **Type I, Type II** (CFII) or **Type III** (CFIII).

     Notes:
     Not all PDAs have CF slots built-in. Some PDAs have add-on CompactFlash™ adaptor jackets or expansion packs available which can be used with the EasySense Flash Logger.

     The EasySense Flash Logger cannot be plugged direct into a PC Card Slot, PC Card Slot jacket, or a PCMCIA card unless connected via a CompactFlash™ adaptor.

     *A Multimedia slot (MMC) or a Secure Digital (SD) card is **not** suitable.*

C.F. Adaptor Jacket

   - To run the Sensing Science software, the PDA needs a **PocketPC** operating system (regardless of processor type).

     Note: *The Palm OS operating System is **not** suitable.*

2. *Smart Q* sensors. Up to three *Smart Q* sensors can be recorded simultaneously.

3. A serial or USB cable. This is used both to download the Sensing Science program and to transfer files from the desktop computer to the PDA.

What else is required to use the Flash Logger on a Tablet PC?

1. A Tablet or Laptop PC running Windows XP – referred to collectively in this manual as a **Tablet PC**.

   The Tablet PC needs to have a **CompactFlash™** slot available – **Type I, Type II** (CFII) or **Type III** (CFIII).

   The *EasySense* Flash Logger cannot be plugged direct into a PC Card Slot **unless** connected via a CompactFlash™ adapter.

Notes:
*The EasySense Flash Logger will **not** operate when connected via a CompactFlash to USB memory card reader. These low cost devices are intended to allow images, etc. from digital cameras to be transferred to the PC. They are not full specification interfaces and as such cannot operate with the Flash Logger.*

*A Multimedia slot (MMC) or a Secure Digital (SD) card is **not** suitable*

2. *Smart Q* sensors. Up to three *Smart Q* sensors can be recorded simultaneously.

Installing the Sensing Science software on a PDA

Note: *It is essential to uninstall any previous versions of the Sensing Science software from the PDA before commencing installation.* *See Problem Solving on page 15.*

To install the software onto the PDA you will need:

1. A desktop or laptop computer (IBM PC or compatible) running Windows 95, 98, Me, NT4, 2000 or XP.

2. ActiveSync software (supplied with the PDA) installed on the desktop computer.
3. A serial or USB cable (to connect the PDA to your desktop computer for transferring the program).

Installation

- Connect the PDA to the desktop computer using the serial or USB cable.
- Ensure that ActiveSync is installed and running and that a connection to the PDA has been established (see the manual that came with the PDA for details).
- Place the Sensing Science CD-ROM (included in the *EasySense* Flash pack) in the desktop computer. Select the CE option from the installer window and follow the on-screen prompts to install onto the PDA. If the installer does not start automatically, open an explorer window onto the CD-ROM and double click on SETUP.EXE in the CE folder.

- Upon completion of the installation disconnect the PDA from the desktop computer, eject the CD ROM and store safely.

Note for Windows NT and Windows 2000 users: *This program should be installed with Administrative Privileges on the system.*

Note: *Sensing Science is not an embedded application. If the PDAs power is lost then the Sensing Science program and any saved files will be lost from its memory. To prevent this happening keep the PDA charged and maintain any back-up batteries required.*

Installing the Sensing Science software and *EasySense* Flash Logger drivers on a Tablet

Note: *Log on as Administrator (or with equivalent access rights) on the system.*

Installation

- Insert the Sensing Science CD-ROM (included in the *EasySense* Flash pack) into the CD Drive. Select the PC option from the installer window and follow the on-screen prompts to install the Sensing Science programs onto the computer.

  If the installer does not start automatically, open an explorer window onto the CD-ROM and double click on SETUP.EXE in the PC folder.

- Insert the *EasySense* Flash Logger into the CF slot on the Tablet PC. Windows will automatically detect that a new device has been connected and a wizard will be generated to aid installation. Use the 'install from a specific location' option and direct the installer to the Flash Driver folder on the Sensing Science CD ROM. You may be warned that the drivers have not passed Logo signing, please 'continue anyway' at this point.

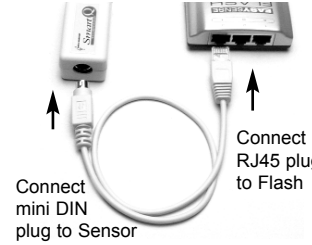
- Upon completion of the installation eject the CD ROM and store safely.

System Setup

1. **Connect the *EasySense* Flash Logger**
   Align the *EasySense* Flash Logger with the CompactFlash™ slot. Gently but firmly insert the *EasySense* Flash Logger into the CF slot as far as it will go.

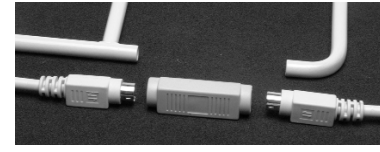
   Note: *To take into account the variation in design of PDA cases, it was necessary to make the Flash Logger slightly longer than the depth of the standard CF slot. This may result in a gap between the Flash Logger and the case of the PDA.*

2. **Connect a *Smart Q* sensor to the inputs socket**
   Hold the *Smart Q* sensor housing with the *Smart Q* label showing on top. Push the *mini-DIN plug on the Flash sensor lead (supplied) into the socket on the sensor housing with the locating arrow on the cable facing upwards.



   Support the *EasySense* Flash Logger with one hand and insert the RJ45 plug from the other end of the sensor lead into one of the sensor sockets (on the top of the Flash Logger).

   To remove a sensor cable from the Flash Logger depress the clip at the back of the RJ45 plug and extract.



*__Note:__ *A few of the Smart Q sensors have leads that terminate in a mini DIN plug (male). To connect these sensors to the Flash sensor lead, a female/female 8-pin mini DIN adaptor (Product No 3710) is required. Contact Data Harvest for further information.*

3. Select **Start, Programs,** the **Sensing Science** folder and select the appropriate program. The first time one of the programs from Sensing Science is used an Interface option window will open. Select **Flash Logger** from the list and tap on (ok).

Smart Q Sensors

Smart Q sensors are equipped with a sophisticated microprocessor that greatly improves the sensors accuracy, precision and consistency. They will be automatically recognised and calibrated. Certain *Smart Q* sensors have multiple ranges or are capable of user calibration (see the Sensor Config. program).
The three inputs on the *EasySense* Flash Logger may be used with analogue and digital sensors.

Analogue type sensors
These level type sensors are capable of measuring physical phenomena such as light level, temperature, sound level, pH ratio etc.

Digital type sensors
These are normally switch type sensors e.g. Light Gates and are capable of measuring on/off conditions.

To maintain consistency with existing software and practice, inputs 1 & 2 are dual labelled as A & B for the Timer application.

Special conditions apply when some *Smart Q* sensors are used with the *EasySense* Flash Logger:

- The power requirements of the original *Smart Q* Motion sensor (Product No 3270) make it unsuitable for use with the *EasySense* Flash Logger. A *Smart Q* Motion sensor with integral battery pack & power supply

(Product No 3705) has been designed to work specifically with the *EasySense* Flash Logger. Contact Data Harvest for further information.

- Only one *Smart Q* Heart Rate (Product No 3147) or Geiger Müller (Product No 3265) sensor can be used attached to the *EasySense* Flash Logger at anyone time.
- The power requirements of some of the Vernier sensors can make them unsuitable for use with the *Smart Q* Vernier adaptor e.g. the CO_2 Gas sensor.
- The Pendulum Sensor (Product No 3155), and the original design of the Light Gate (metal body type), the Crocodile Clips (Product No 3260) and the Timing Mats (Product No 3255), have leads that terminate in a mini DIN plug (male). To connect these sensors to the Flash sensor lead, a female/female 8-pin mini DIN adaptor (Product No 3710) is required. Contact Data Harvest for further information.

Power Requirements

The *EasySense* Flash Logger takes its power from the computer (PDA or Tablet) and has no ON/OFF switch. Inserting or removing the Flash Logger while the PDA is off may cause the PDA to turn on automatically.

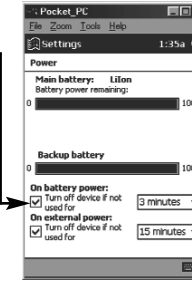
Due to the many variants it is not possible to quote any expected operation times for a PDA that is run from batteries, with the *EasySense* Flash Logger attached. The main factors that will affect operation time include the brightness of the PDAs screen setup, the power settings (used to auto-switch off the PDA if not used for a specified period), and the quantity and type of sensors attached.

The battery power time will be reduced when *Smart Q* sensors that draw a lot of current are used e.g. Heart Rate, Geiger Müller and Light Gates. It is preferable to use the PDA connected to an external power supply when these sensors are to be used for extended periods of time.

When data is being recorded (by clicking on the Start icon in Graph or Timer, or by opening one of the section windows in Meters) the PDA will not auto-switch off. If data is to be recorded over a long timespan it is advisable to connect the PDA to an external power supply.

If one of the applications in Sensing Science has been opened, but no recording has been started then any auto-switch off settings will be used. If the PDA shuts down, press the power button to return to the application.

Note: *To prevent the PDA being shut down when used with an external power supply go to Start/ Settings/ System/ Power and deselect the tick next to the on external power selection.*



Note: *Sensing Science is not an embedded application so if all power is lost then the Sensing Science program and any saved files will be deleted from its memory. To prevent this happening keep the PDA charged and maintain any back-up batteries.*
The PDA uses small amounts of power even when it is switched off to retain the contents of its memory. This can cause the batteries to go dead even when it is not in use.
With some makes of PDA a CompactFlash memory card can be used to create a backup for applications loaded to memory e.g. the Sensing Science program. This can be used to restore data to the PDA should all power be lost or if a full reset has to be performed.

Technical Specifications

Smart Q Sensors	3 inputs
ADC resolution	10 Bit/4mV

Smart Q sensors are capable of 12-bit resolution and the specification stated for each sensor is applicable when they are used with a 12-bit unit e.g. *EasySense* Advanced. The *EasySense* Flash Logger is a 10-bit interface so may not be able to fully utilise this capability and the resolution stated may not be as high.

The *EasySense* Flash Logger is suitable for use in the range 0 – 40°C and 0 – 95% RH (non-condensing).

The *EasySense* Flash Logger is not waterproof.

Avoid use in areas subjected to the following conditions: Static electricity, extreme hot or cold, steam, high humidity, sudden temperature changes or large amounts of dust.

Remove any dust or grease with a dry cloth before inserting into the CF slot.

Should the unit ever fail or otherwise become damaged, contact Data Harvest. There are **NO** serviceable parts inside the *EasySense* Flash Logger.

Information for PDA Users

There are some useful notes on 'Using Pocket PC's in the Classroom' available to download from our website (www.data-harvest.co.uk). The following information has been extracted from these notes.

Closing applications

PDAs do not automatically close programs when they stop being used. It is important to exit each Sensing Science application before opening another (e.g. exit Meters before opening Graph). If not both applications will try and talk through the same communication port. To prevent this happening always use **File** and then **Exit** to close an application.

Note: *PocketPC 2002 adds an (X) icon to the top right corner of most applications which looks like an exit icon however it will not actually terminate the program, it simply closes the window but keeps the program running.*

To close any programs running either:

- **Start** Menu, select **Settings,** select **System** from the row of tabs, **Memory, Running Programs** and select **Stop All**.
- Do a **Reset.**
- Use a third party application to close a program.

Printing Information

A Print option is not available in the CE version of the Sensing Science application. It is possible to print a screenshot using an additional software application or by downloading files to a desktop computer and printing from there.

To print a screenshot:

PDAs have an Infrared (IR) port that can be used to communicate with a suitably equipped printer with an IR port. In order to print using IR an additional application is required e.g. PocketShot from Field software. Once installed this software will allow a screenshot from the PDA to be captured and either saved as a .BMP file or printed directly to an IR equipped printer.

To download files:

Use ActiveSync to move the saved file to a desktop computer (e.g. a SID data file) and load into the PC Windows version of a suitable application (e.g. Sensing Science). Print from the application on the desktop computer.

Resetting the PDA

If the PDA should fail to respond a 'Reset' can be performed (this is similar to a computer reboot). It will not cause the deletion of the Sensing Science application or any files that have been saved to memory. Any data that is the process of being input or edited (without being saved) will be deleted. To perform a **'Reset'** locate the reset button (usually in a small recess somewhere on the back or bottom of the PDA); press this button using the stylus. The unit will switch off and then almost immediately bleep and re-start showing the Today screen.

A **'Full Reset'** can be performed if the reset fails to solve the problem. This will delete all data from memory and returns the PDA to its status when first purchased (the Sensing Science program will be deleted from the PDAs memory). Before performing a full reset remove the *EasySense* Flash Logger from the CF slot. Check in the PDAs hardware manual for instructions on how to execute a full reset or memory initialise. After performing the full reset, re-install the Sensing Science program.

Note: *With some types of PDA a backup of the memory data on the PDA can be made using a CompactFlash memory card. This can be used to restore data to your PDA should all power be lost or if a full reset has to be performed.*

Problem Solving

1. 'Resetting' the *EasySense* Flash Logger

If the software 'loses contact' with the *EasySense* Flash Logger during use try selecting either Reset Interface (in the Meters application) or select Interface from the File menu (in Graph or Timer) and click on OK. If that doesn't solve the problem, exit the application in use, remove *EasySense* Flash from the CF slot, **Reset** the PDA (press the reset button using the stylus) and insert Flash Logger. Restart the software application required.

2. To uninstall any previous versions of the Sensing Science software from the PDA

On the PDA select Start/Settings/System/Remove Programs/select DHG Sensing Science Laboratory or Primary from the list and select Remove. If any remnants of the program are left in the PDA or PC the Sensing Science Install Wizard on the PC will show a modify, repair or remove the program page. Select Remove and then re-install as standard.

3. Unrecognised Card [Unknown card in Socket 1]
This message will be displayed if the Flash Logger has been connected to the PDA before the Sensing Science program has been installed (the drivers for Flash are incorporated as part of the installation). If this message is displayed at any other time exit the application in use, remove *EasySense* Flash from the CF slot, Reset the PDA and insert the Flash Logger. Restart the software application required.

4. Unable to open port ECE1, Cannot communicate with Flash Logger, Unable to connect to Flash, Serial port is already in use.
Any of these messages could be displayed if the Sensing Science application cannot communicate with the Flash Logger. Exit the application in use, remove *EasySense* Flash from the CF slot, Reset the PDA and insert the Flash Logger. Restart the software application required

5. The PDA screen keeps switching off
Press the power button on the PDA to switch it back on.
To reduce battery consumption the PDA can be set so that after specified period of time, if data is not being logged or the stylus hasn't been used, the PDA will shut down. Alter the settings to a more convenient time - select **Start**, **Settings**, **System** tab, **Power**. To prevent the PDA being shut down when used with an external power supply deselect the tick next to the external power selection.

6. What else can I do to reduce battery consumption?
The brightness of screen can be altered - select **Start**, **Settings**, **System** tab, **Brightness** tab to adjust the brightness of the display or the **AutoDim** tab to automatically dim the display after a specified period of time. Another factor that affects battery consumption is sound. Select **Start**, **Settings**, **Personal** tab, **Sounds**, **Volume** tab to quieten the volume of screen taps, etc.

Warranty
All Data Harvest products are warranted to be free from defects in materials and workmanship for a period of 12 months from the date of purchase provided they have been used in accordance with any instructions. This warranty does not apply if the product has been damaged by accident or misuse.

In the event of a fault developing within the 12-month period, the product must be returned to Data Harvest for repair or replacement at no expense to the user other than postal charges.

Using the *EasySense* Flash Logger with the CE version of the Sensing Science software

Note *for Tablet users:* *A .pdf of the Windows manual for the Sensing Science software is available in the Manual folder on the Sensing Science CD ROM.*

The software will load into a Sensing Science folder in Programs. This folder will contain 5 applications.

1. **Meters -** This application displays live data from analogue sensors in four different ways. Designed to introduce students to the idea of sensing data and interpreting information. The four display modes are Gauge, Colour Change, Bar and Number.

2. **Graph -** This application is used for recording and graphing signals from analogue sensors. There are facilities for analysing data.

3. **Sensor Config -** This program is for use with those *Smart Q* sensors that have either multiple ranges or are capable of user calibration.

4. **Timer -** This application is used to allow students to study Time, Velocity and Acceleration relationships using digital (switch-type) sensors.

5. **Workroom -** The purpose of this application is to allow the selection of experimental worksheets/activities.

Note: *All of the screenshots in this manual are from a PocketPC. Whilst the appearance of the software may vary slightly when used with Handheld PC, all of the instructions and descriptions remain the same.*

Selecting the Correct Interface

The first time one of the programs in Sensing Science Laboratory is used, an Interface option window will open to allow the correct interface to be selected.

Select **Flash Logger** as the correct interface from the drop-down menu.

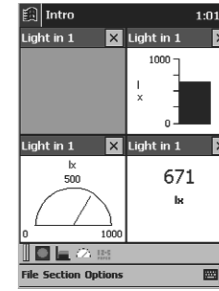
Click on (ok). The program will save your selection so it will be automatically configured when next used.

The Meters Program

Do NOT attempt to run Meters at the same time as other Sensing Science programs, as it will be unable to establish communication.

Starting Meters

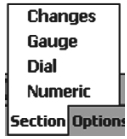
- Select Start
- Select Programs.
- Select the Sensing Science folder.
- Select the Meters icon.



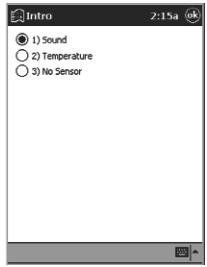
The Four Types of Display

Up to four section windows can be open at any one time and they can be any combination of sensors and displays.

A Section window can be opened either from the Section Menu or by tapping on the appropriate icon.



Click on the close button [X] to close a section window.

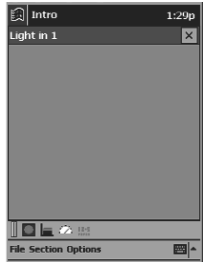


To alter the sensor displayed, double tap in the section window and a Sensor Selection window will open. Select the sensor to display in that section from the list. Click on (ok).

If only one window is used, it can be maximised to fill the whole window by selecting Full Size from the Options menu.

Changes

This is the simplest of all four sections. It displays a block of colour that changes to reflect the value being collected by the sensor.



For some sensors, these colours are ‘coded’ to those that students may associate with the item being measured:

Temperature: The coloured block begins at light blue and then works its way up to become red at the top of the selected temperature range.

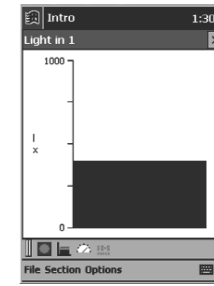
Note: *See page 23 for details of how to change the range of the temperature sensor.*

Light: The coloured block begins at black for no light, working through greys until it becomes white for full light.

Note: *To alter the sensor displayed, double tap in the section window, a selection window will open. Select as required and click on (ok).*

Gauge

This section will display a simple bar gauge that increases and decreases with the measured value.

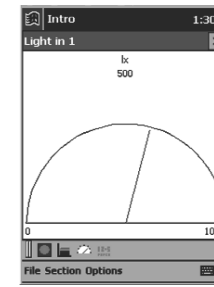


The scale on the left-hand side is divided into four sections and is automatically set by the software to correspond to the sensor it is representing.

The maximum and minimum value recorded can be displayed on the right-hand axis by two short lines. Select Show Min/Max from the Options menu. Tap on Reset Min/Max in the Options menu to reset these values.

Dial

This section displays a simple dial that moves to the right as the measured value increases and, likewise, moves to the left as the value decreases.



The scale around the dial is automatically set by the software to correspond to the sensor it is representing.

Two thin lines can display the maximum and minimum value recorded. Select Show Min/Max from the Options menu. Tap on Reset Min/Max in the Options menu to reset these values

Note: *To alter the sensor displayed, double tap in the section window, a selection window will open. Select as required and click on (ok).*

Numeric

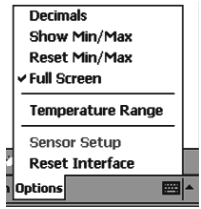
This section displays the currently measured value as a number and the units of measure being used e.g. Light in Lux.

The maximum and minimum value recorded will be displayed if Show Min/Max is selected from the Options menu.
Tap on Reset Min/Max in the Options menu to reset these values.

To switch decimal numbers on or off, select or deselect Decimals from the Options menu.

Options Menu

The Options menu allows for selection of the different features that can be used in data display.



Decimals

Used to switch decimal numbers on and off from the section display. If decimals is ticked, values will be displayed in decimals. Without decimals selected, the reading will be truncated to a whole number.

Show Min/Max

Used to switch the maximum and minimum value indicator on and off from the displays. If the Show Min/Max is ticked, the maximum and minimum value will be displayed. Deselect the tick to remove the indicator from the displays.

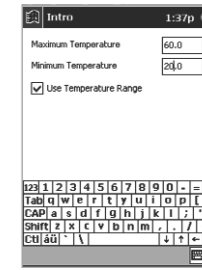
Reset Min/Max

Tap on Reset Min/Max in the Options menu to reset maximum and minimum values.

Full Screen
Any one section (Changes, Gauge, Dial or Numeric) can be used as a full-screen window. Select Full Screen in the Options menu to display a section as full screen size. While the Full Screen option remains ticked, a section will automatically open as a full screen size window. Deselect the tick to return to a quarter size screen.

Note: *Only one section at a time can be open in full screen mode.*

Temperature Range
For many experiments, the temperature range is too large. The temperature set range option allows a smaller range to be set.



To set a temperature range:

- Select Temperature Range from the Options menu.
- Use the 'keyboard' to enter the new maximum and minimum temperature ranges required e.g. 20ºC to 60ºC.
- Tap on the 'Use Temperature Range' option box (a tick will appear).
- Tap on (ok) to set the range.

Once a range has been set and the Use Temperature Range box is ticked, all temperature sensors in all sections will operate within the selected range. These settings are automatically stored and will be used each time the Meters program is loaded.

To reset to the original settings, select Temperature Range from the Options menu and 'un-tick' the Use Temperature Range box. Tap on (ok) and the original settings will be restored.

Note: *If the temperature being recorded rises above the maximum or falls below the minimum limits that have been set, Meters will be unable to accurately display the true value.*

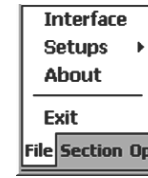
Sensors Setup
The sensors are automatically identified when the program is loaded so this option will not be available and will appear 'greyed out'.

To change sensors while the program is open, simply replace the sensor with a different kind, and the program will automatically change the sensor settings so that the correct calibration scales are displayed.

Reset Interface
This option is used to re-establish contact with the interface being used.

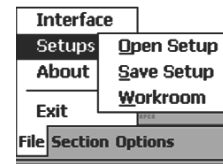
File Menu

Note: *A Save option is not available for this program as the data collected is live and therefore cannot be saved.*



Interface
Used to select the type of interface being used and the serial port to which it is connected.

Setup Menu
The settings for an experiment i.e. the sections open and the options for these sections, can be saved as a Setup file. This allows the use of the same settings at a future date without going through the setup process. This feature is useful if used with a prepared worksheet for pupils to follow. When a setup is saved, a folder is created with the same file name. This folder contains a blank HTML file called index.html. This index.html file can be edited or replaced with one of your own worksheets.



A setup file can be opened either using Open Setup or via the Workroom application.

Open Setup
Tap on Setups and select Open Setup. Select the My Experiment Setups folder, and the type as Meters Setups. Tap on the Meters Setup file to Open.

To open the Setup file with its accompanying worksheet, use the Workroom application.

Save Setup
Setup the parameters for the experiment e.g. the Numeric section, displayed as Full size with a temperature range of 10^{0} to 40^{0}C, with Input No (1) as the selected sensor.

Tap on Setups and select Save Setup. Use the 'keyboard' to type in a suitable filename. Save your setup inside the 'My Experiment Setups' folder as a 'Meters Setup' in the 'Main memory'. Tap on OK. The file will be saved as a Meters Setup .ssi file.

You will then be prompted for a description of the Setup file. Use the 'keyboard' to type in a clear description e.g. to explain what the Setup is meant to record or the name of the worksheet that accompanies it. This description will be displayed in the Workroom application. Click on (ok).

When the Setup file is saved, a folder with the same file name is created. This folder contains a blank HTML file called index.html.
Note: *The setup file saves the number of the input that has been allocated to a section – not the sensor type. For example, if four different sections have been saved with Temperature in 1, it will load the four different sections with whatever sensor is connected to Input 1 on the interface.*

About
For the version number of Meters and the Sensing Science program.

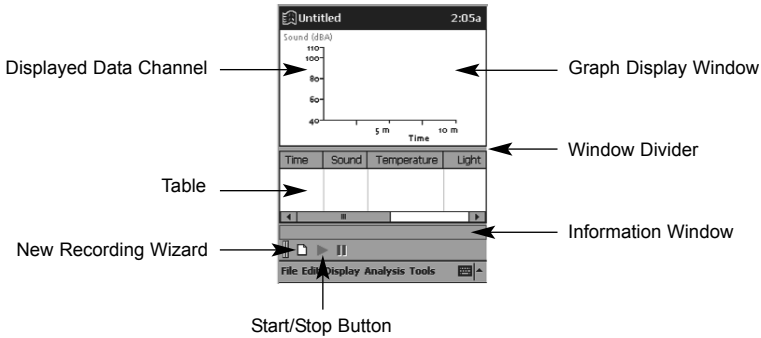
Exit
To exit the Meters program.

The Graph Program

Do NOT attempt to run Graph at the same time as other Sensing Science programs, as it will be unable to establish communication.

Starting Graph

- Select Start
- Select Programs.
- Select the Sensing Science folder.
- Select the Graph icon.



The Graph Window

The Graph Window is where readings will be displayed and contains the tools needed to set up, collect and analyse data.

Each data channel is allocated a different colour i.e. channel one is red, channel two is blue, and channel three is green. These colours relate to the channel of

data, not the type of sensor or the input number e.g. if temperature sensors are used connected to Input 2 and 3, they will be allocated to the first available data channels, Channel 1 (red), & Channel 2 (blue).

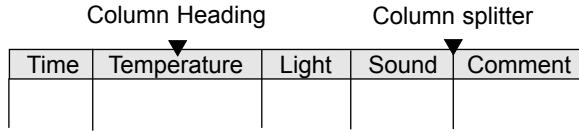
Setting up and customising the Graph Window

To alter the size of the graph / table area, position the stylus over the window divider and drag up or down.

To alter the data channel (sensor) displayed on the vertical axis, tap in the area to the left of the axis. Subsequent taps will cycle the y-axis through all of the connected sensors.

Customising the Table

The width of the columns in the table can be increased or decreased. Drag the column splitter left or right accordingly.



The Comment Column

In the table, double-tap on the relevant cell in the Comment column. Enter text or numbers into the dialogue box by using the ‘keyboard’. Tap on (ok).

To Edit or Delete, double-tap on the comment to re-open the dialogue box and alter as required.

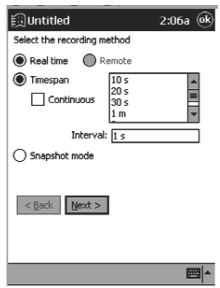
Recording Measurements (Primary Mode)

To check which mode the program is running in, tap on Display. If Advanced is ticked the program will be running in advanced mode, deselect for primary mode.

Note: *If you want to repeat the last experiment (with all of the same settings) just tap on the Start button.*

New Recording Wizard

Click on the New Recording Wizard button and the first stage of the Recording Wizard will open.



- Real Time will automatically be selected (readings will be displayed on the graph, as they are collected).

  Note: *The Remote option is not available for the EasySense Flash Logger so will appear 'greyed out'.*

- Select whether you want to record over a selected Timespan or as individual Snapshot readings.

  Timespan

  Select a suitable recording duration from the list available. The recording time range is from 10 seconds to 31 days. The interval between each sample will automatically alter when the time duration is selected.

  Continuous

  If ticked the recording will continue until stopped by tapping on the Start/Stop icon. The graph will start with the selected time-span and when this time has elapsed, the time-span will double continuously.

Snapshot mode
Each time you tap in the graph area, the current value for each active sensor is recorded and displayed.

- Click Next for the second stage – the Sensor Wizard.

  The *Smart Q* sensors will automatically register. If readings are not required from a particular sensor, tap to deselect the tick from the box.

  If the connected sensors are altered, either tap on ID or (ok) to close and then re-select the New recording Wizard. The change of sensor will automatically be registered.

- Click on (ok) to finish.

Recording Measurements (Advanced Mode)

To check which mode the program is running in, tap on Display. If Advanced is ticked the program will be running in advanced mode.

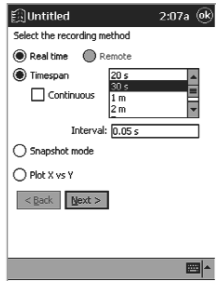
Advanced mode has a three stage Recording Wizard to set up the available options before capturing data.

Note: *If you want to repeat the last experiment (with all of the same settings) just tap on the Start button.*

New Recording Wizard

Click on the New Recording Wizard button and the first stage of the Recording Wizard will open.

- Real time will automatically be selected (readings are displayed on the computer screen, as they are collected).



Note: *The EasySense Flash Logger does not have the Remote facility, so the Remote option will be 'greyed out'.*

- Select whether you want to record over a selected Time span, or to take individual Snapshot readings, or to plot an X vs. Y graph.

Time span

Select a suitable recording duration from the list available. The recording time range is from 10 seconds to 31 days. The interval between each sample will automatically alter when the time duration is selected.

Continuous

If ticked the recording will continue until stopped by tapping on the Stop icon. The graph will start with the selected time-span and when this time has elapsed, the time-span will double continuously.

Snapshot mode

Each time you tap in the graph area, the current value for each active sensor is recorded and displayed.

Note: *Selecting Snapshot will automatically default to showing Reading Number on the X-axis and deselects the option of choosing a Time-span or an X vs. Y graph. It is still possible to select Time or Sensor as the X-axis from the Display Wizard Menu. If Time is selected, readings are still taken when you tap in the graph area but are displayed with the time interval at which the readings were recorded.*

Plot X vs. Y

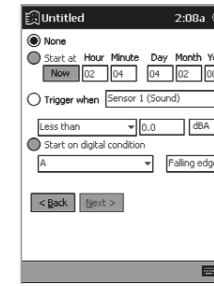
This option allows you to plot the readings of one sensor against another – useful for looking at the relationship between two variables.

Note: *You must have at least two sensors connected. The X-axis will default to Sensor - no other options are available.*

- Tap on Next for the second stage - the Sensor Wizard.
  The sensors connected will automatically register. If readings are not required from a particular sensor, tap to deselect the tick from the box.

  If the connected sensors are altered, either tap on ID or (ok) to close and then re-select the New recording Wizard. The change of sensor will automatically be registered.

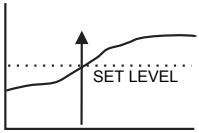
- Tap on Next for the third stage – the Start Condition Wizard. This is used to set the condition required for the recording to start. The data capture will begin when the start condition is met.



  None - to begin recording as soon as the Start icon is selected.

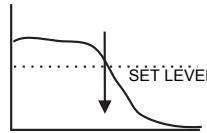
  Start at – is not available for the *EasySense* Flash Logger so will be 'greyed out'.

  Trigger when - to start recording when a sensor is less than, greater than, rises above or falls below a set value. Select the sensor and the trigger from the drop-down menu. Use the 'keyboard' to type in the trigger value. Tap on (ok). To start recording tap on the Start icon, a ''waiting for start condition'' message will appear in the information window below the graph. When the trigger condition is reached the recording will begin.



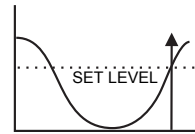
Greater than

For example:-
To start recording when the value from a temperature sensor is greater than 15°C.



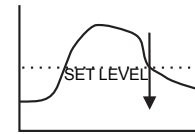
Less than

For example:-
To start recording when the value from a temperature sensor is less than 15°C.



Rises above

For example:-
Logging will not start until the value rises to above the set level.



Falls below

For example:-
Logging will not start until the value falls to below the set level.

Start on digital condition - is not available for the *EasySense* Flash Logger so will appear 'greyed out'.

- Click on (ok) to finish.

To Begin Recording Data

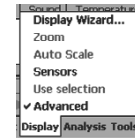
Start icon
To begin recording, simply tap on the Start icon.
If the recording duration is for 5 hours or more, a message to connect the PDA to external power will be displayed. Click on (ok) for the recording to start.

Stop icon
During logging the Start icon will change to a Stop icon. Tap on the Stop icon to stop data being recorded before the selected duration has passed.

Pause icon
During data capture, it is possible to 'pause' the display. Tap on the Pause icon, the screen is 'frozen' but the recording will continue unseen

on the screen. Tap on the Pause button again to cancel the freeze and display the hidden graph.

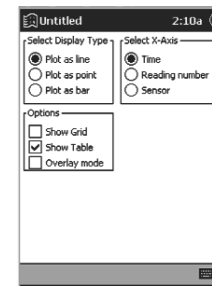
Displaying Captured Data



The Display Menu

Select the **Display Wizard** from the Display Menu.

Note: *Used in certain modes some options will not be available and will appear 'greyed out' e.g. when in X vs. Y mode, the only available option for the X-axis will be a Sensor.*



Select Display Type

- Plot as line - the readings are joined and displayed as a line graph.
- Plot as point - the readings are displayed as unconnected points on the graph.
  Note: *Points may be plotted together so closely that they will appear as a thick line.*
- Plot as bar - readings are displayed as a bar graph.

Select X-Axis

- Time - the selected time span is used for the X-axis.
- Reading Number - the X-axis will be set to the number of single readings taken from a sensor, without any regular time interval between them. This axis is normally used for Snapshot data.
- Sensor - the X-axis is set to use one of the data channels. To alter the data channel selected, tap below the X-axis on the Graph window to cycle through the channels and make a selection.
  Note: *This option will not be listed when used in Primary Mode.*

Options

- Show Grid - places a faint grid on the graph.
- Show Table – if this box is not ticked, then a graph will automatically fill the

window. If ticked then the window will automatically be divided to display both the Table and the Graph window. Position the stylus over the window divider and drag up or down to alter the size of the Table window.

- Overlay Mode – allows a new set of data to be graphed without the previous set of data being erased - useful for repeating an experiment to compare data. If Overlay is selected when in Snapshot mode, the readings taken are added to the end of the existing data.
  Note: *A maximum of 7 data sets can be displayed on one graph.*

Click on (ok) for the options selected to be used.

Zoom
Once data has been collected, an area of the graph can be magnified so that it can be seen in greater detail.

Select Zoom, tap and hold the stylus on the screen, drag the rectangular box that appears over the area to be magnified.

If further expansion of the magnified area is required repeat - with zoom still selected.

While this option is active the words Display: Zoom will be displayed in the information window. Deselect Zoom to return to the original graph.

Auto Scale
This option takes the y-axis limits from the minimum and maximum values of the data collected. The scale will be set to the values of the data assigned to the vertical axis.

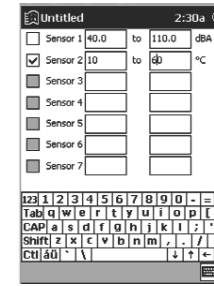
Tap to the left of the vertical axis to select the data channel to be auto-scaled.

Select the Autoscale option. The graph will automatically be adjusted.

Deselect Autoscale to return to the original scale.

Sensors

This option can be used to hide or show data in the graph window and to alter the axis limits of a sensor.



Deselect the tick from the box to hide the data from a sensor.

Use the 'keyboard' to type in the new limits and tap on (ok).
Tap on Reset to restore the limits to the full sensor range.

Note: *Although it is possible to select a scale outside of a sensors pre-set limits, the values from the sensor will remain within its pre-set limits.*

Use selection

Select the data required then select Use selection and the application will alter to use the selected data only.

Deselect to restore the original data.

Selecting Data

To select individual readings: -
Tap on a reading in the table or at a point on the graph - the reading will be highlighted in the table and marked with a cursor line on the graph.

To select more than one reading in a series: -
Tap and drag the stylus over the readings in the graph area. (On a Handheld PC- hold down the SHIFT key while dragging over the required section).
To deselect readings: -
Click a point outside of the selection.

Advanced
Graph can be used in two modes, Primary and Advanced. In Advanced mode, higher level set up and analysis features become available.

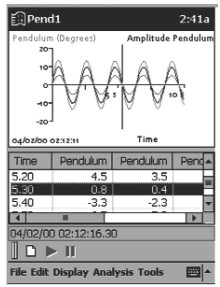
If Advanced is ticked the program will be running in advanced mode. Tap on Advanced to deselect for primary mode.

Analysing captured data

There are a number of tools built into Graph to allow the analysis of captured data.

Tap on **Analysis** to open the Analysis menu.

Values
Select Values and tap with the stylus in the graph area. A vertical line (cursor) will appear which can be moved around the graph using the stylus. Position the cursor at the point on the graph from which information is needed. The corresponding value will be highlighted in the table.



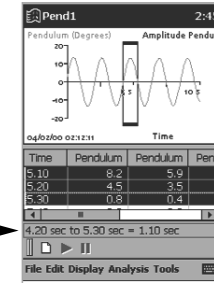
The Information bar will either indicate the elapsed (from zero until that point) or the absolute time (the time & date from the start of recording until that point) on the graph.

Note: *If the X-axis is a sensor, then cross hair cursor lines will appear to indicate what the value from the sensors would be if they crossed at the cursor point.*

De-select Values by re-selecting it in the Analysis menu.

Interval

Select Interval and tap on a point in the graph to produce a fixed vertical cursor. Drag to a second point on the graph. A box will be drawn around that section of the graph and the values selected will be highlighted in the table.



The Information bar will display the time of the first point, the time at the second point and the interval between them.

Tap and drag to take a new interval reading.

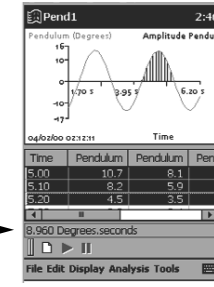
De-select Interval by re-selecting it in the Analysis menu.

Note: *This option is not available with an XY graph.*

Area

This feature is used to calculate and display the area under a chosen section of the graph. The calculation is performed for the data selected on the Y-axis.

- Select the appropriate data channel.
- Click and drag across the appropriate section of the graph. Lines will appear to mark the section.



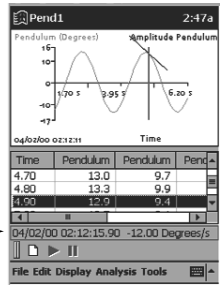
The value for the area marked will be shown in the information box. The units correspond to the product of the units of the vertical and horizontal axis.

De-select Area by re-selecting it in the Analysis menu.

Note: *This option is not available when in Primary mode or with an XY graph.*

Gradient
This feature calculates the rate of change of data in the vicinity of the cursor. The calculation is performed over three points either side of the cursor.

- Select the appropriate data channel.
- Click on Gradient and a vertical cursor with a small straight line will appear to indicate the slope of the graph at that point. As the stylus is moved across the screen, this straight line will follow the gradient of the graphed line.



The gradient will be shown in the information box.

De-select Gradient by re-selecting it in the Analysis menu.

Note: *This option is not available when in Primary mode or with an XY graph.*

Using Tools on the captured data

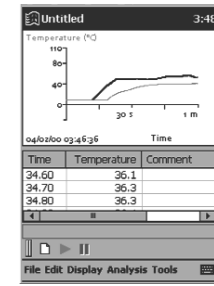
There are a number of tools built into Graph to allow the analysis of captured data.

Tap on Tools to open the Tools menu

Predict
Used to anticipate the effect of making a change to the measured parameter while data is being recorded e.g. if a light sensor is placed into a black bag.

Once the display has been paused, lines can be drawn on the graph to predict where the sensor line will go.

To make a Prediction:



- Click on the Start button to begin recording.
- Click on the Pause button, to 'freeze the display'.
- Click to the left of the vertical axis to select the appropriate sensor.
- Change the environment the sensor is measuring (e.g. place the light sensor in the bag).
- Click on Predict
  Tap on the screen - a thick line will appear attached to the graph line from the selected sensor. This line can be drawn to predict where it is thought a line from the sensor is going/has gone. Click with the stylus at different points on the graph to fix the line in position.
- To stop re-select Predict from the Tools menu.
- Click on Pause to cancel the freeze and display the hidden graph.

Predict can be reselected to make multiple predictions.

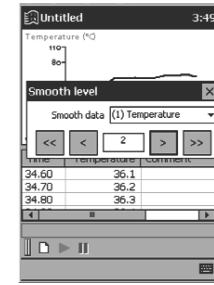
Use Erase Predictions from the Tools menu to delete any unwanted prediction lines.

To make a prediction using a different sensor, tap to the left side of the Y-axis until the required sensor is selected.

Note: *The Predict option is not available when in Snapshot mode or with Reading number selected as the X-axis.*

Smooth

Used to 'even out' the data of a selected line by applying a moving average.



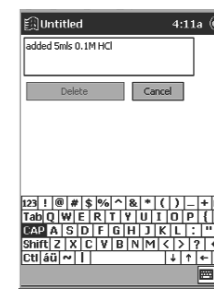
Select Smooth from the Tools menu. The currently selected data channel will be shown in the dialogue box. To alter the channel, tap on the arrow and select from the drop-down menu. The Y-axis will alter to reflect the channel selected.

Click on the > button to smooth or < to reverse the process. The smooth level advances at one unit at a time for the > symbol and 5 units for the >> symbol.

Close the window when the smooth level is correct.

Text

Used to annotate the graph with 'text boxes' that can be placed at any position in the graph area.



Text boxes have a line that is used to point to the area to which it refers.

- Ensure that the graph is stopped or paused. Select Text from the Tools menu.
- Tap at the point on the line that you want the label to refer to.
- Use the 'keyboard' to type in the required text and tap on OK.
- Tap on the screen and the text box will appear. The text box can be dragged to the required location.

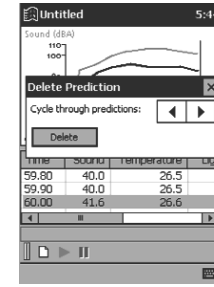
When the text tool is selected the label can be moved at any time-tap and drag it to a new position.

The label can be edited or deleted. With Text still selected, double tap on the text box. Alter the text or select delete to delete the text label.

While this option is active the words Tools:Text will be displayed in the information window. The Text option will remain active until it is deselected (by re-selecting Text from the Tools menu).

Title
To place a title on the graph select Title from the Tools menu. Use the 'keyboard' to type in the text for the title.

Erase Predictions
Select Erase Predictions from the Tools menu.



Use the forward and backward buttons to cycle through the prediction lines. As each line is selected it will turn red on the graph. Click on the Delete button to erase the prediction. Click on X to cancel.

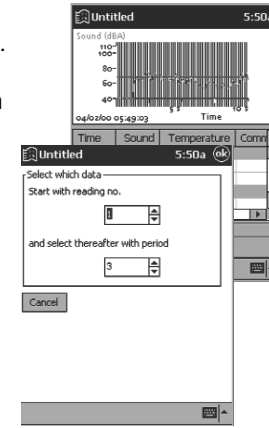
Erase Data Set
Used to erase the entire set of data from a sensor channel. Click on Erase Data Set from the Tools menu.

The Erase Data Set window will open. Choose the data set to erase from the drop down menu. Click on Delete Data Set to permanently erase the entire set of data from that channel. To cancel, tap on (ok).

Selection Wizard

Allows a user to select readings at specified intervals e.g. starting from the first reading, select every third reading. Click on (ok) - the selected readings will be highlighted in the table and marked with a cursor line in the graph.

Click on Use selection from the Display menu and the application will alter to display only the selected data.



The Function Wizard

Having collected experimental data, it is sometimes useful to calculate a new set of data derived from those results e.g. to calculate the angular velocity from a pendulum trace.

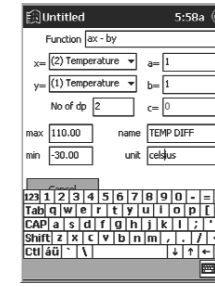
- Select Function Wizard from the Tools menu.
- Select a formula from the function drop down menu e.g. *a dx/dt.*
- Select the appropriate data channels from the x and/or the y drop down e.g. *x = [1] Pendulum.*
- Use the 'keyboard' to type in the name and units for the derived data e.g. *Velocity & m/s*.
- Use the 'keyboard' to type in the number of decimal places to be shown in the table.
- Alter the max & min values to scale the axis for this data.
- Click on (ok) to create the data set.

The available functions are:

$ax^2 + bx + c$	a sin(bx) + c	ax + by	a dx/dt
a/x + c	acos(bx) + c	ax - by	Average(x,a)
$a/x^2 + c$	a log(bx) + c	axy	a
a/(x^b) + c	a exp(bx) + c	ax/y	(x-a)/b

The values for:

- x and or y can be Time in (s) or (cs), Reading or Data channel.
- a & b are constants, i.e. a number or scalar,
- c is an offset or intercept number.



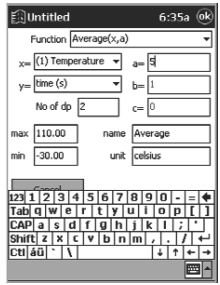
Example: an experiment looking at energy transfer through a polystyrene cup. The difference between the two temperature probes (one inside & the other outside the cup) can be calculated using the *ax-by* function.

Example: an experiment to investigate electrical power and its relationship to the size of current flowing. Power is calculated using the *axy* function. Power = current *(x)* x voltage *(y)*. The value of *a* = 0.001 is used to convert the measurements for current in mA to Amps.

Note: *Up to a maximum of 7 data sets are available. Use the Erase data set option to delete any mistakes.*

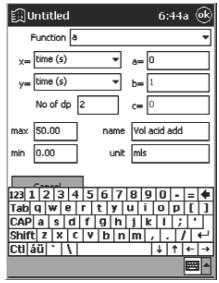
To calculate an Average

- Select the Function Wizard.
- Select the function as Average *(x,a),* where *x* is the selected data channel and *a* is the frequency of sampling e.g. if *a* = 5, an average will be calculated for each set of 5 samples. Click on (ok).



To enter Data Manually

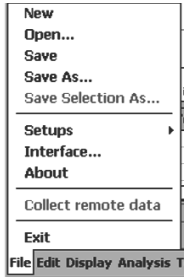
- Select the Function Wizard.
- Select the function as *a*, where *a* = 0. Rename the column & enter the units as appropriate.
- Click on (ok).
- A column full of zeros will be created. Double tap on a cell and enter the value.



File Menu

New

Can be used as an alternative method of opening the New Recording Wizard.



Open

Used to load previously saved data. Locate the correct .sid file and tap to open.

Save

Provided the file has been saved previously, the data will be automatically saved, retaining the name given the first time it was saved.

Save As
A dialogue box will open to allow the captured data to be saved using a filename and destination of your choice. Files are saved in .sid format.

Save Selection As
Used to save a selection of the collected data. Select the data required from the Table or Graph display. Click on Use selection and the display will change to use only the data selected. Select Saved Used Selection As and a dialogue box will open to allow the captured data to be saved using a filename of your choice. Files are saved in .sid format.

Note: *This option will not be available until the Use Selection option has been used.*

Setups
To open an existing setup, save the current setup or launch the Workroom.

Interface
To select the type of interface being used and the serial port to which it is connected.

About
For the version number of Graph.

Collect remote data
The Remote option is not available for the *EasySense* Flash Logger so this will appear ‘greyed out’.

Exit
Used to quit Graph. You will be prompted to save the file if you haven't already done so.

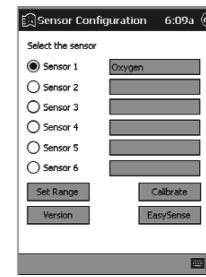
Edit Menu

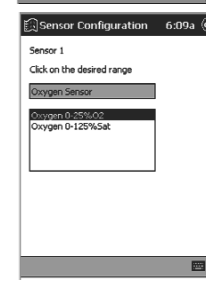
Copy Table
Used to copy the current Table onto the clipboard from where it can then be pasted into spreadsheet, word processor or desktop publishing applications.

The Sensor Configuration Program

Do NOT attempt to run the Sensor Configuration program at the same time as other Sensing Science programs, as it will be unable to establish communication.

Note: *Select the correct interface and serial port from any of the other applications in this package before using the Sensor Configuration application.*





All *Smart Q* sensors are automatically calibrated but some have multiple ranges e.g. oxygen, or are capable of user calibration e.g. pH. This program can be used to select a suitable range or to allow the user to adjust the calibration constants.

Set Range
Used to select the correct range for the experiment e.g. to select either Oxygen in air 0 - 25%O_2 or Oxygen in fluid 0 - 125%Sat.

- Connect the *Smart Q* sensor to the *EasySense* Flash Logger and run the Sensor Configuration program.
- Select the sensor requiring configuration from the list.

- Click on the Set Range button. The current range selected will be highlighted.
  Note: *If no choice is available the message 'This sensor is not configurable' will be displayed.*

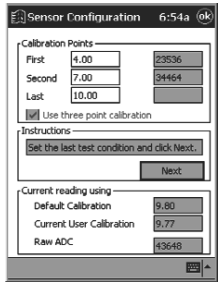
- Select the required range and tap on (ok).

Calibrate
All *Smart Q* sensors are supplied calibrated. Certain sensors allow the user to adjust the calibration constants to the conditions of the experiment. This part of the program allows the user to adjust the sensor reading at either two or three points in its range. The adjustments made will affect the whole sensor range, between and beyond these points. The accuracy of the user calibration will depend upon the number of calibration points used and their spacing.

For example:
The pH sensor has a default calibration set for operation at a temperature of 25°C. If the samples being measured are at a lower or higher temperature, then this default calibration may be improved by manual calibration. Buffer solutions are used to set the values for the calibration points. It is essential that the buffer solutions used are at the same temperature as the samples in the experiment and that the calibration point entered is for the value of the buffer used at that temperature. For example, a buffer solution with a pH of 7.01 at 25°C can change its value to 7.10 at 5°C, or 6.98 at 40°C.

- Select the sensor requiring configuration from the list.

- Click on the Calibrate button.
  Note: *If no choice is available a message to say 'This sensor cannot be calibrated' will be displayed.*



- If only two samples are available for setting the calibration points, tap to deselect the tick in the Use Three point calibration box. Only the First and Last calibration points will then be available.

- Use the 'keyboard' to type in the value of **all** the buffers that will be used.

- Place the sensor in the sample with the lowest value e.g. pH 4 buffer. When the displayed reading stabilises, click on the Next button & an ADC value will automatically be entered into the First Values box.

- Place the sensor in the mid range sample e.g. pH 7 buffer. When the displayed reading stabilises, click on the Next button & an ADC value will automatically be entered into the second Values box.

- Place the sensor in the highest value sample e.g. pH 10 buffer. When the displayed reading stabilises, click on the Next button & an ADC value will automatically be entered into the Last Values box.

- The message 'The User range has been programmed ' will be displayed. These user calibration values will be stored in the *Smart Q* sensor and will be retained even when the sensor is not in use.

- Click on the Set Range button and select 'User calibration' as the range.

The lower section of the Calibrate sensor window displays the current reading from the selected sensor.
Default calibration - Shows the measured value using the default calibration built into the sensor.

Current User calibration - Shows the value measured using the calibration points last configured by the user.
Raw ADC - Shows the value from the analogue digital converter in *EasySense* Flash in a range of 0 – 65535. This value is used by the software to calculate the calibration constants.

Version
Used to check the version number of the *Smart Q* sensor. Inside each sensor is a microprocessor, which has it's own version number. This information can be used during the fault finding process e.g. the sensor in use is Version 1.0 of the Light level sensor.

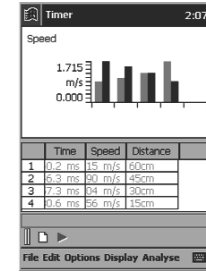
***EasySense* Information**
Click on the *EasySense* button to check the type and version number of the *EasySense* unit being used.

The Timer Program

Do NOT attempt to run Timer at the same time as other Sensing Science programs, as it will be unable to establish communication.

Starting Timer

- Tap the Start button
- Tap on the Sensing Science folder
- Tap on Timer



The Timer Window

The Timer Window is where readings will be displayed and contains the tools needed to setup, collect and analyse data.

The program will open in Table & Graph mode. To adjust the percentage of Graph vs Table displayed, drag the divider bar up or down.

The width of the columns in the table can be increased or decreased. Position the stylus over a column divider and drag to adjust the width.

Digital Sensors

A digital sensor is a switch type device that has only two states, high and low. These levels are taken to indicate ON and OFF.

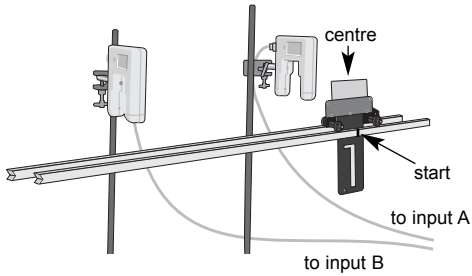
Connect the digital sensors being used to the interface. Measurements can be taken from either a single sensor connected to Input A or from two sensors connected to both Input A and B.

Timing Apparatus

The diagram shows a typical apparatus set up for use with the Timer program.

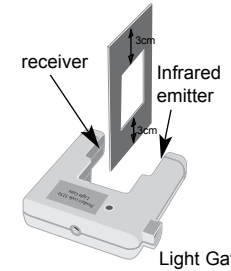
Light gates are connected to input A and B on the *EasySense* Flash Logger and are used to monitor the movement of a trolley down a ramp.

A timing card is fixed to the top of the trolley. Ensure that this card cuts through the light gate's infrared beam.



To enable calculations to be made from the measurements taken, it is necessary to enter the parameters used in an experiment.

For example, to calculate speed from A to B, enter the distance between the two light gates.



Note: *The receiver can be sensitive to high levels of ambient infrared light, shield from bright light.*

To calculate acceleration through a single light gate a double interrupt card is used. The segments that pass through the light gate must be equal in width.

Note: *It is recommended that a rigid, black rectangular interrupt card be used for most experiments.*

Recording Measurements

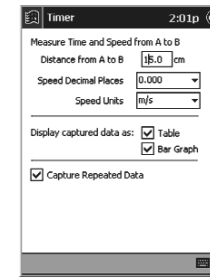
Timer can be used in two modes, Primary and Advanced.

Primary Mode

Click on Options to check which mode the program is running in. If Advanced is ticked the program will be running in advanced mode, deselect for primary mode.

Primary mode has a simple, one stage Record Wizard that is used to measure Time and Speed from A to B.

Tap on New Setup and the recording wizard will open.



- Measure the distance between the sensor connected to Input A and the sensor at Input B. Use the 'keyboard' to type in the value.
- Select the number of decimal places and the units for display from the drop-down menu.

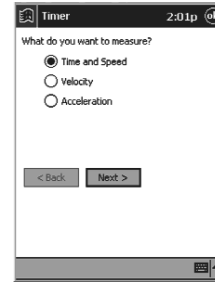
- Select whether the data captured is to be displayed as a table, a bar graph or as both (this choice can be changed during and after recording).
- If the Capture Repeated Samples box is ticked, successive measurements will be recorded. If not, a single measurement will be taken.

Note: *If the distance between the sensors is changed during an experiment, the distance value in the Record Wizard must also be altered to ensure accurate calculation of speed.*

Advanced Mode

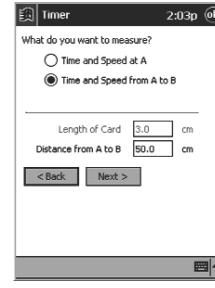
Advanced mode uses a three step record wizard to set up the available options before capturing data.

Tap on New Setup and the recording wizard will open.



- Select what is to be measured - Time and Speed, Velocity, or Acceleration.

- Click on the Next button to move to the next step.

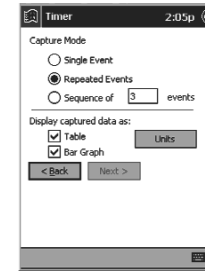


- Select what you want to measure e.g. Time and Speed at A or Time and Speed from A to B.

- Use the 'keyboard' to type in the measurement required i.e. either length of card, segment or distance from A to B. Click on Next to move to the next step.

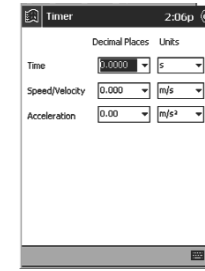
- Select the capture and display options. Data can be captured as a single event, repeated events or the number of events can be specified.

  Select whether to have the data displayed as a table, as a bar graph or both. This choice can be changed at any time during and after recording.



- Tap on the Units button to specify the units and number of decimal places displayed (0 to 0.0000).

  Each measurement has its own drop-down menu.



Parameter	**Units**
Time	ms (milliseconds) and s (seconds)
Speed/Velocity	m/s, cm/s, mm/s, mph, km/h
Acceleration	m/s2, cm/s2, mm/s2

- Click on (ok) to finish.

Advanced Mode Options

The complete options available in Advanced mode are:

Measurement	**Parameters required**
<u>Time and Speed</u>	
Time and Speed at A	Length of single interrupt card
Time and Speed from A to B	Distance from A to B

Velocity

Velocity at A	Length of single interrupt card
Velocity at A then at B	Length of single interrupt card
Velocity at A or B	Length of single interrupt card

Acceleration

Acceleration at A	Segment length of a double interrupt card
Acceleration from A to B	Length of single interrupt card

Measurement at A
Uses one sensor connected to Input A. Timing starts when the signal changes and stops when it changes back i.e. for an object passing through a light gate, the recorded time is the duration of the light beam being interrupted. If used with Timing mats, it will record the duration of an object being placed on the mat.

Measurement from A to B
Uses two sensors connected to Input A and B. A measurement is taken for the time an object takes to travel from the sensor at Input A to the sensor at Input B. Timing starts when the signal at Input A changes and stops when the signal at Input B changes.

Measurement at A then B
Uses two sensors connected to Input A and B. Three measurements are recorded of an object travelling from the sensor at Input A to the sensor at Input B. The measurements are:

1. Time to pass through Sensor A
2. Time to pass through Sensor B
3. Time to travel from A to B

Measurement at A or B
Uses two sensors connected to Input A and B. A single measurement will be taken from whichever sensor detects the change in signal level. The measurement will be the time to pass through sensor A or sensor B.

To Begin Recording Data

Click on the **Start** icon. Timing measurements will begin when the sensor detects an event.

During logging the Start icon will change to a **Stop** icon.

- Measurements will be taken when A or A and B are interrupted, and will automatically be entered into a table and/or a bar chart.

- Measurements will stop being recorded when either the number of events selected has been reached or if you tap on the Stop icon. When measurements have stopped, the icon will revert to a Start icon.

To continue collecting measurements, to add to the existing data, simply tap on the Start icon.

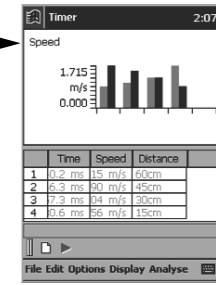
To clear the collected measurements and retain all the present settings, select New from the File menu.

To clear the collected measurements and make changes to the existing settings, tap on the new recording wizard icon.

Displaying Captured Measurements

When measurements have been taken, the display can be altered either by selecting Table, Bar Graph, or Table and Graph from the Display menu or by moving the window divider.

Altering the Vertical Axis on the Bar Graph
To alter the measurement displayed on the vertical axis of the bar chart, tap on the data name (above the vertical axis) e.g. tap on Time to change to Speed and vice-versa.

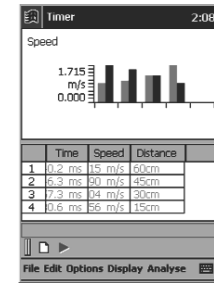


Subsequent clicks will cycle the axis display through the data channels available. The scale is automatically adjusted to the largest value collected.

Using the Comments column

In the table, double-tap on the relevant cell in the Comment column. A dialogue box will appear for you to add text or numbers from the 'keyboard'.

To Edit or Delete, double-tap on the comment to re-open the dialogue box and alter as required.



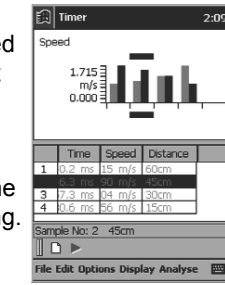
The heading at the top of the Comment column can be edited e.g. Comment changed to Distance. Tap on Comment at the top of the column and change the title. Data entered into this 'non-comment' column will be saved as another data set.

For example: -
Alter the Comment column heading to Distance. Measure the Speed at A of a vehicle travelling down a ramp at different start points. Record the distance travelled each time in the distance column. Select Graph from the Analyse menu. Plot an XY graph of Speed against Distance travelled.

Selecting Data

To select an individual reading: -

Tap on either the reading in table or at a point on the bar graph. The reading will be highlighted in the table and marked with a horizontal cursor in the bar chart. Any data or text that has been added to the comment column will be displayed in the information window.



To select a series of readings, tap on the first reading, use the 'keyboard' to select the SHIFT key and tap on the last reading. To deselect the readings, tap on the SHIFT key and then tap outside the data in the table area.

To select more than one reading, use the 'keyboard' to select the CTRL key (it will highlight) and then tap on each reading in turn.
To deselect all readings, deselect the CTRL key and then tap outside the data in the table or bar graph.

Use Selection
This option allows the user to select and use only the data points of interest. Select the data required. Select Use Selection from the Display menu.

Deselect to restore the original display of data.

To Delete Data
Select the row or rows of data to be deleted.

Select Delete from the Edit Menu to permanently erase the selected items.

Note: *Delete will not be available whilst logging.*

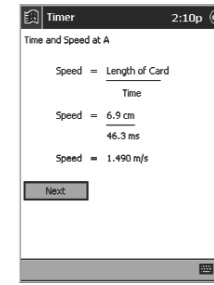
Analysing Captured Data

Select the required option from the Analyse Menu.

Note: *When used in primary mode, the Graph option will not be available.*

Show Calculation

This option shows how the result has been calculated for the selected reading. The formula and measurements used in the calculation are shown.



Select a reading from the table. Select Show Calculation from the Analyse menu.

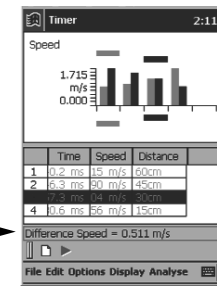
Click on Next to see the calculation for the next reading or (ok) to finish.

Difference

This option calculates the difference between two readings.

Select the first reading to be used for comparison. Select Difference from the Analyse menu. The chosen reading will be highlighted in purple.

Click on another reading. The difference between the two readings will be displayed in the information window.



It is possible to continue to select second readings to compare with the first reading.

Deselect Difference to finish.

Average
This option will calculate the average of the selected readings.

Start by selecting the readings. Select Average from the Analyse menu.

The average of the selected readings will be shown in the information window. As new readings are selected the average will be recalculated.

Deselect Average to finish.

Graph
Data collected in Timer can be imported direct into the Graph program.

Click on Graph. As the Timer program is still open the Graph program will display a communications message as it loads to warn that the 'Serial port is already in use' Click on OK.

The Graph program will load with the captured Timer data. Any data that has been entered into an altered comment column will be transferred as a data set.

For example: - Alter the Comment column heading to Distance. Measure the Speed at A of a vehicle travelling down a ramp at different start points. Record the distance travelled each time in the distance column. Select Graph from the Analyse menu. Plot an XY graph of Speed against Distance travelled.

The Timer program will remain open in the background. Remember to return to the Timer program after Graph to exit the program correctly.

File Menu

New
Used to clear the existing data from the table and graph. The program reverts to the settings selected in the New Record Wizard.

Open
Used to load previously saved data. Locate the correct .sid file and tap to open.

Save
Provided the file has been saved previously, the data will be automatically saved, retaining the name given the first time it was saved.

Save As
A dialogue box will open to allow the captured data to be saved using a filename and destination of your choice. Files are saved in .sid format.

Note: *Files saved in .sid format can be loaded into any program able to load text files or CSV (comma separated values) files. Files contain information about units and measurements to allow free exchange of data between a variety of applications.*

Interface
To select the type of interface being used and the serial port to which it is connected.

Setups
To open an existing setup, save the current setup or launch the Workroom.

Collect Remote
The Remote option is not available for the *EasySense* Flash Logger so this will appear 'greyed out'.

About
To find the version number of Timer software.

Exit
Used to quit Timer. You will be prompted to save the file if you haven't already done so.

Edit Menu

Copy Table
Used to copy the current table onto a clipboard from where it can then be pasted into spreadsheet, word processor or desktop publishing applications.

Delete
Use to delete the selected readings. Useful when there is an anomalous reading to remove.

Options Menu

Change Units
To change the units and decimal places used for Time, Speed & Velocity and Acceleration.

Advanced
Click the tick on to select Advanced Mode and off for Primary Mode.

Display Menu

Table
Switch on/off the table display mode.

Bar Graph
Switch on/off the graph display mode.

Table and Graph
Display both the graph and the table display.

Columns
Used to hide or show columns of data displayed in the table.

Example: If Time and Speed at A is selected then two columns are normally displayed - Time at A and Speed at A. Deselecting the tick next to Time at A will hide the time data so that only the Speed at A data is displayed.

Use Selection
Select the data required. Select Use Selection from the Display menu.

Deselect to restore the original display of data.

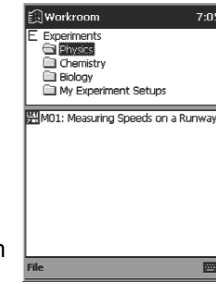
The Workroom Program

The purpose of Workroom is to store pre-set experimental worksheets. The user can write their own worksheets, or pre-prepared HTML files can be loaded into a word processor and then customised by the user.

The Sensing Science Primary program has a selection of pre-prepared activities included e.g. Curtains, which uses a light sensor to investigate the properties of fabrics. Teacher's notes for these activities are available in a .pdf format in the Manuals folder on the Sensing Science Primary CD ROM.

The Sensing Science Laboratory program has some examples of pre-prepared investigations e.g. Temperature changes as a measure of respiratory activity as an example of a Biology investigation. Further pre-prepared worksheets are available to purchase separately e.g. Key Stage 3 and the additional Physics worksheets.

Starting Workroom



- Tap the Start button.
- Tap on the Sensing Science folder.
- Tap on Workroom.

In the top section of the Workroom window is a list of the Experiment folders. If one of these folders is selected, a list of the experiment worksheets stored in this folder will appear below. The size of these two sections can be altered. Position the stylus over the window divider and drag up or down to adjust.

Using Workroom

- Tap to open the folder that contains the desired worksheet (Physics, Chemistry Biology, etc).
- Tap on the worksheet to launch it.

Creating, Saving and Opening a Setup

Creating a Setup

Set up the parameters for the experiment using the Meters, Graph or the Timer program.

Meters

- Select the sections to be open i.e. Numeric, Dial, Gauge, Change.
- Select the data channel to be displayed in each section e.g. 1] Temperature.
- Select any options required for display i.e. Decimals, Show Min/Max, Full Size, Temperature range.
  For example, select the Numeric section, to be displayed in full size, with the sensor connected to Input 1, with a temperature range of -10 to 40^{0}C.

Graph

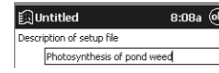
- Select Primary or Advanced mode.
- Use the New Recording Wizard to set up the recording method i.e. Real time, Time span, Snapshot or X vs. Y. If the recording is to be against time, select the duration.
- Ignore the sensor selection window, as the Setup file will be automatically set to whatever sensor is plugged into the interface.
- Set any special start conditions.
- From the Display Wizard select the display type, the X-axis, and the options available i.e. Grid, Show Table, and Overlay.

Timer

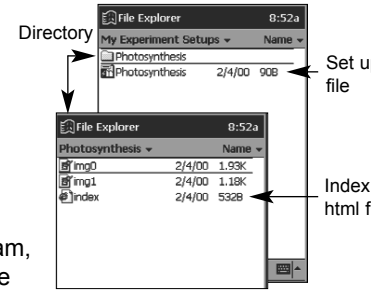
- Select Primary or Advanced mode.
- Use the New Recording Wizard to set up want you want to measure i.e. Time & Speed, Velocity or Acceleration.
- Select whether from at A, from A to B, at A then B, at A or B. Enter the parameter value i.e. card or segment length, or distance from A to B.
- Select mode of capture and the display options.

Saving a Setup

- Select Save Setup from Setup in the File Menu of the application.
- The Save As dialogue box will open. Save the setup into the 'My Experiment Setups' folder.
- Type in a suitable filename and tap on OK.
- The next part of the saving process is for a textual description of the setup file - this description will be displayed to the students when they open the file from Workroom.
  Type in a description, (ok).



The Setup is saved together with a directory (created with the same file name) that contains an HTML file called index.html. This file will load into Internet Explorer when the Workroom is used to load the Setup.



This index.html file can be edited or replaced with one of your own worksheets giving instructions for the experiment.

Opening a Setup File

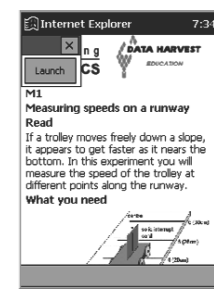
A Setup file can be opened in two ways:

1. From the Graph, Meters or Timer program, select Open Setup from Setup in the File menu. Open the appropriate folder and select the file.

   Note: *By loading in this way the Setup is loaded but not the associated HTML Worksheet.*

2. Start the Workroom program or select Workroom from Setup in the File menu of the Meters, Graph or Timer program.

   Select the appropriate experiment from the list in the folder e.g. open the Physics folder and select MO1 'Measuring Speeds on a runway' from the list. The HTML Worksheet will open together with a Launch window. Click on Launch to load the correct section i.e. Graph, Meters or Timer. Click on [x] to cancel.


Internet Explorer 7:34a
Launch
DATA HARVEST
M1
Measuring speeds on a runway
Read
If a trolley moves freely down a slope, it appears to get faster as it nears the bottom. In this experiment you will measure the speed of the trolley at different points along the runway.
What you need

Worksheets

In order to make full use of the workroom, you may wish to create a worksheet to accompany the experiment setup file. The Workroom worksheets, complete with diagrams, graphics, etc. are based on the HTML format.

- Create a setup using the required experiment parameters in Meters, Graph or Timer.
- Save the setup in the 'My Experiment Setups' folder and enter the setup file description. A directory will be created (with the same file name) which contains a default index.html file. This is the file that you will replace with one of your own worksheets.
- Exit the program.
- Synchronise your PDA with the Desktop computer to copy the setup information to the Desktop.

  Note: *Ensure that the 'files' option of ActiveSync is switched on – this will automatically synchronise the 'My Documents' folder of the PDA to the PC. As the My Experiment Setups folder is within 'My Documents' the newly created setup will be copied to the PC automatically.*

- On the desktop computer load an application that is suitable for creating your own worksheet i.e. one that can save HTML format files, such as MS Word, MS Publisher or MS FrontPage. Create your own worksheet.
- In case any editing is needed at a later stage, save the worksheet in the applications normal format e.g. as a Word document.
- Save the document again as an index.html file into the directory that has the same name as the setup file.

  Note: *Ensure that the file is saved as .html - some applications will save as an .htm file, which will then not work correctly with the Workroom application. If this happens rename the file to add the missing l (so .htm becomes .html).*

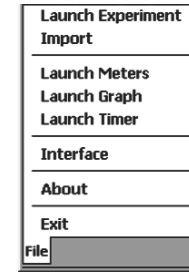
  Applications used to create HTML files (such as MS Publisher) may want to create more than just the index.html file e.g. pictures to go on the page that have been saved as GIF or JPG's. If this is the case, ensure that ALL of the files are saved in the same folder.
- Re-Synchronise the PDA to ensure that the modified/created HTML file is transferred back to the PDA.

- Load the Workroom program. Select the ‘My Experiment Setups’ folder and then the experiment worksheet from the list (it will be listed using the textual description given during the saving process).
- The HTML worksheet will open together with the Launch window.

File Menu

Launch Experiment
Can be used to launch the selected experiment.

Import
This is used to move Setup files saved in a different storage location into the ‘My Experiment Setups’ folder.



Launch Meters
Used to start Meters without first loading a worksheet.

Launch Graph
Used to start Graph without first loading a worksheet.

Launch Timer
Used to start Timer without first loading a worksheet.

Interface
Used to select the interface and the connection being used. The program will save your selection so it will be automatically configured when Sensing Science is next used.

About
For the version number of Workroom.

Exit
Used to close the Workroom application.

Notes: